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# West Europe Report

SCIENCE AND TECHNOLOGY

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18 October 1984

## WEST EUROPE REPORT

### SCIENCE AND TECHNOLOGY

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## ADVANCED MATERIALS

### FIBER COMPOSITE MATERIAL FOR AIRBUS TAIL UNIT

Munich-Ottobrunn MBB INTERNATIONAL in English Sep 84 p 9

[Text]

Stade (ütz). MBB's Stade factory will have the first complete Airbus vertical tail units made of modern fibre composite materials in production by next spring. This will be the beginning of a new chapter of advanced manufacturing technology for the Airbus. The factory itself is at a turning point in its development into the most forward-looking plant in its region, after 25 years of working in metal. MBB is investing just under 14 million Marks up to 1985 to make the Stade factory into the composite materials centre within the Transport Aircraft Division.

**T**he Airbus A310-300 will be the first passenger aircraft in the world to fly with a composite primary assembly as a standard, from the middle of the 1980s on. Roughly 20 per cent of the weight can be saved on this stressed structure that is over eight metres high and weighs 1200 kg in total.

Following many years of work in the fibre composites area, 1985 will be a decisive year for the Transport Aircraft Division. Large-scale static/dynamic tests are to demonstrate that the use of composites for stressed structures will open the way to greater economy in civil aircraft manufacture.

All A310 aircraft have been equipped with CRC rudders (the moving part of the vertical tail

unit) ever since certification. Since then, work has been concentrated on the stressed structure, the entire vertical tail unit's centre box. Because of its value as a pioneering undertaking, the Fibre Composite Vertical Tail Unit project is being sponsored by the Federal Ministry of Research and Technology.

New materials for the Airbus tail unit will not only cut down the aircraft's fuel consumption, but will also reduce production costs in the medium term. Development of a concept for economic series production of such large-size composite assemblies has been completed, and the first shells for test use have already been produced in the special jigs measuring 13.7 by 4.1 metres which MBB has developed for the purpose. ■

CSO: 3698/625

## ADVANCED MATERIALS

### SUPERPLASTIC FORMING OF COMPOSITES FOR COMBAT AIRCRAFT PARTS

Munich-Ottobrunn MBB INTERNATIONAL in English Sep 84 p 10

[Text]

**Augsburg (ww). An air intake section made in one piece of titanium has been manufactured at the MBB Augsburg factory as a study object for the next generation of combat aircraft. Two new technologies have been combined here for the first time: super-plastic forming (SPF) and carbon fibre reinforced carbon (CC) material in the die. This experiment illustrates how large components of substantially lower weight can improve flight safety and also be manufactured more economically.**

**T**he advantages of SPF technology can best be explained by an example. The Tornado air intake duct is composed of 16 different extruded metal parts with nearly 5000 rivet joints and the related connecting sheets, to which several kilograms of sealant to seal the rivet joints must be added. If this component could be manufactured in one piece by the SPF method, this would not only reduce weight, but also offer the advantage that an intake duct made of titanium could be used as a fuel-resistant and absolutely leak-proof wall for an integral tank.

The air intake section manufactured as a preliminary to the construction of a roughly 4.5-m

SPF air intake duct now nearly completed, consists of a titanium alloy with good super-plastic properties at the appropriate forming temperature. The nominal length of the experimental section is 1000 mm, or 1400 mm including the "overflows". The contour changes over gradually from a circle with a diameter of 700 mm into a rounded quadrilateral measuring 720 by 500 mm. The section was formed from a titanium sheet tube 460 mm wide and closed at the ends, which was equipped with an argon compressed gas connection and placed in a CC die. Here the tube was heated to the forming temperature and "blown" into the required shape by the argon gas.

The experiment described here makes use for the first time of the Augsburg factory's experience both in the super-plastic forming of smaller titanium parts and in the use of carbon fibre composites (e.g. CRC tailerons for the Tornado and an experimental CRC component for a fighter for the 1990s). Compared with steel dies, CC dies have the technical and economic advantages of high strength for low weight, low shrinkage on cooling and easier adaptation to difficult parts geometry (because of the usual laying technique for CRC). Moreover, the parts themselves are not only cheaper, but considerable cost can also be saved in making the dies. ■

## AEROSPACE

### DANISH COMPANY DESIGNS GUIDANCE SYSTEM FOR ARIANE 5

Copenhagen BERLINGSKE TIDENDE in Danish 12 Sep 84 p 11

[Article by Jens J. Kjaergaard]

[Text] Experts from Røvsing will guide new space rockets. The system is intended for use in the next generation of booster rockets that will come into use in 1992. The final report on the project will be written under any circumstances. It will be possible for Danish specialists to continue to set their mark on space research.

Experts at Chr. Røvsing have come a long way with the development of electronic systems that can guide a new generation of the European Space Agency's heavy booster rockets, known as the Ariane 5, which are expected to go into operation in 1992.

The studies have been carried out by civil engineer Finn A. Hass and technical engineer Orla M. Olsen with the aid of 150,930 kroner from the research secretariat.

There is a prospect of receiving another appropriation of around 200,000 kroner and the final report will be written under any circumstances, said Finn Hass, who is quite sure that Danish specialists will be able to go on asserting themselves in the space industry sector.

The guidance system that is being developed is at least 100 times more reliable than the mechanical part of the rocket, he pointed out.

The system will be at least as reliable as those required for manned space travel. And it is also likely that Europe will build a mini-space shuttle.

### Digital Technology Saves Room

Finn Hass and Orla Olsen recommend the use of digital technology to save room and reduce weight.

Another important part of the study deals with the electrical supply to the electronic circuits of a rocket stage, with due regard to the vibrations that can occur during the violent fiery lift-off. The weight can be reduced with the use of thick film.

"We got going on the design to be in a good starting position when the Ariane 5 really came on the drawing board. At the moment attention is focused on the rocket engines. That involves the biggest development costs and risks," Hass pointed out.

#### Keeping an Eye on Ice at Sea

The project, which so far only exists on paper, is one of several ESA [European Space Agency] follow-up research projects that currently receive 6 million kroner a year.

The money is included in the national budget for the purpose of promoting opportunities to carry out scientific and technical projects against the background of Denmark's membership in the European Space Agency.

Another project will result in an almost automatic monitoring of the enormous ice flow along the east coast of Greenland by NOAA satellites. The research will receive 111,650 kroner. University engineer Bruno Wolff is working on a licentiate report. Navigation conditions are very difficult for most of the year; there can also be a risk to drilling platforms and other offshore structures. Therefore it is important to know about the movements of icebergs and the large ice floes, he pointed out.

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## CIVIL AVIATION

### FRG OUTFITTERS FEEL SHORTCHANGED IN AIRBUS PROGRAM

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 29 Aug 84 p 11

[Article by Klaus Broichhausen: "German Airbus Outfitters Want More Orders: Bonn Intervenes in Paris on Behalf of Electronics"]

[Text] Bonn, 28 Aug--Politely but emphatically, the federal coordinator for the aircraft industry, Parliamentary Undersecretary Martin Gruener, indicates in a letter to the French Transport Minister Paul Quilès that the German outfitting industry should be appropriately involved in the cockpit of the new A-320 airbus. French partner Aerospatiale is responsible for the fully electronic cockpit in the European Airbus program. Signals for the guidance of the 150-seat aircraft are given by computers. Gruener has the impression that there is the intention to purchase these flight guidance computers exclusively from French companies. The federal government, however, expects the German outfitting industry to get a fair chance in competing with the French, especially since the FRG is making an adequate contribution to financing the project. Gruener presses this point in his letter.

Sources in Bonn are trying to exert influence on the eve of important decisions concerning the letting of subcontracts. These contracts must be allotted soon so that the introduction of the aircraft is not delayed. Much is still uncertain. Government representatives of the countries involved are meeting at the beginning of September in Toulouse for a predecision vote. The aircraft industry maintains that much depends on the coming decisions, not only for the individual company but for industrial development in the FRG as well. An equipment supplier that is passed over for Airbus 320 may be locked out of the business for years. It is important for a company, it is claimed, that it be able to demonstrate its advanced engineering in practice as a supplier for the Airbus. This is also in the interest of German industry as a whole, the outfitters maintain. Most branches of industry would receive spin-off benefits from a technically advanced aircraft industry. The call for a reasonable role for German suppliers of technical equipment was already sounded last spring when the federal government made the decision to allocate 1.5 billion marks in subsidies through 1990 for the "small" Airbus. The federal government holds that it is fair that not only the middle and rear sections of the aircraft fuselage by manufactured in the FRG but that the German outfitters

participate to a greater extent in other ways as well, reflecting their heavy involvement--38 percent--in the financing of the project.

There have been complaints by the FRG equipment sector since the founding of European Airbus Industry that it is being shortchanged in this partnership arrangement. There has also been repeated criticism that the French suppliers receive more backing from their government. There, however, it is a question of a state industry that is closely tied into politics and bureaucracy. Equipment manufacturers have to admit, though, that they turned to civil aviation construction too late and concentrated too long on connections with the state procurement offices for military technology.

There is no doubt that the involvement of the German equipment industry in the "hi-tech components" of the first Airbus programs was infinitesimally small. In the preparation phase for model A-310, increased efforts have been made on the part of business and the federal government since 1978. It was then that the often-heard expression emerged--picked up on even by members of parliament--that the Germans paid too much for the Airbus and were contented to be the fuselage builders, the tinsmiths, whereas the other partners supplied the modern technology.

As the producer of the fuselage parts, Messerschmidt-Boelkow-Bloom Inc (MBB) has always resisted this view. First, it claims, aircraft construction is highly technical precision work, and secondly, the involvement of the German equipment industry is increasing. For the A-320 Airbus, a 20-percent content ratio for FRG equipment is in the offing. This is regarded as a substantial advance. MBB judges that a thorough job is being done by the international selection system by which bodies render decisions concerning the bidders' performance, engineering and price. MBB is also keeping close watch on this selection process to see that there are no distortions operating against German suppliers. But isolated cases are arguable. Gruener has now seized on one such case. Bonn's position is that, ultimately, the one best able to do the job will be awarded the contract. But in open discussion between the European partners, there must be concern that the interest of each country be kept in balance. Only in this way, Bonn believes, can the Airbus partnership prove successful in the long run and become a model for other plans for cooperation in the European Community.

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## CIVIL AVIATION

### AIRBUS TO BUILD TA-11 LONG-RANGE AIRCRAFT

Paris AFP SCIENCES in French 23 Aug 84 pp 27-29

[Text] Paris--An Airbus Industries spokesperson indicated to AFP on 21 August that the European consortium has decided to renew its project for the TA-11 long-range, 200-300 seat aircraft, in order to break the quasi-monopoly of the American Boeing 747.

If the conditions for launching the TA-11 are met in 1986, which Airbus Industries is presently expecting, the aircraft could be placed in service at the beginning of the 1990's.

The TA-11 project, which the company had been keeping in its files for a number of years, is deemed profitable because the world market for this type of plane, with its 10,000-12,000 km radius of action, has defined itself, according to the latest Airbus Industries studies published in the group's letter of disclosure.

Airbus Industries, which estimates the total market for long-range aircraft at 1140 planes by the year 2002 for the western countries, points out that most of the demand is met by North American companies.

According to the study, Europe should represent 35 percent of the total market, North America 23 percent, Asia and the Pacific 22 percent, with the remainder distributed among Africa, South America, and the Middle East.

Officials at Airbus Industries believe that the future TA-11 "would offer airline companies the possibility of escaping the monopoly situation that now prevails in the long-range aircraft category, which allows an American manufacturer (Boeing) to dictate its prices to the market."

On a flight such as London-Los Angeles, Airbus Industries explains, an airline would find it more profitable to fly two TA-11's in parallel (one in the morning and the other in the afternoon, for instance), than a single large plane, because it is much easier to distribute passenger traffic among two flights than to concentrate it in a single one.

Moreover, the same source continues, with the TA-11 it would be financially possible to provide connections for very distant medium-sized cities, whereas such connections are not very profitable with a large plane due to a low occupancy coefficient.

According to the consortium, collaboration is just beginning among the four partners associated in Airbus Industries: Aerospatiale (France), Messerschmidt-Bolkow-Blohm (FRG), British Aerospace (GB), and Construcciones Aeronoticas (CASA-Spain).

Two versions of the TA-11 are presently considered: the TA-11-100, with a capacity of 200-260 passengers, and the TA-11-200, which could carry about 300 passengers.

The TA-11 could benefit from the technical knowledge acquired with the A-320. It would have a "variable wing curvature, which would allow the latter to achieve an optimized aerodynamic configuration for each flight phase and level," Airbus Industries indicates.

In the 100 version, the plane could be equipped either with four V-2500 engines from International Aero Engines (combining the American Pratt and Whitney, the British Rolls Royce, the German Motoren und Turbinen, and the Japanese Japan Aeroengines), or with CFM56-5's from CFM International (the French Snecma and the American General Electric), the same jets that power the A-320. The TA-11-200 would be equipped with improved versions of the V-2500 or CFM56-5 engines.

This aircraft would thus complete the Airbus family, which already includes three series of short and medium range two-engine planes: the A-300 (220-345 passengers), the smaller A-310 (190-220 seats), and the A-320 (150-170 seats), which should be unveiled in 1988.

The Airbus Industries consortium, created in December 1970, has become the world's second largest builder after Boeing. More than 405 Airbus planes (combining all versions of the A-300, A-310, and A-320) have been ordered by 50 different companies, and 268 of them were delivered, during the past 10 years.

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## CIVIL AVIATION

### THOMSON GETS CONTRACT FOR AIRBUS A320 INSTRUMENT PANEL

Paris L'USINE NOUVELLE in French 13 Sep 84 p 29

[Article by Herve Rolland: "Avionics: Thomson at the Controls of the A320"]

[Text] After a close competition with the U.S. company Sperry, Thomson--supported by Jaeger--has won the contract for the A320 instrument panel. The French tandem can now claim to be a major competitor in this specialty.

A nice success for the French industry on the much coveted market for equipment for the A320, the latest member of the Airbus family, the first units of which will fly in 1988. Thomson was selected to supply the instrument panel for the A320, as well as one of the two electronic flight-control subsystems.

The instrument panel is the visible part of the avionics--all the piloting and navigation instruments--but what is found today in the cockpit of airliners no longer has much in common with the traditional dials of the first airplanes. Right in front of the pilot are two color screens based on liquid-crystal technology. The first provides the pilot with all flight parameters (speed, altitude, artificial horizon, etc.); on the second, the aeronautical map indicating the route followed is scrolling by. This is the triumph of electronics!

Although Thomson, in collaboration with its German partner VDO Flight Instruments Factory, had already been awarded the avionics contract for the Airbus A310, it was by no means sure of getting the A320 contract, which should amount to several hundred million francs if sales of that aircraft come up to expectations. "Competition between Thomson and the U.S. company Sperry was especially close," Maurice Bernard, civilian-project advisor at Thomson-CSF, pointed out.

"The Americans showed that they could make very nice things, and we had to offer the best of our technology in order to be chosen." Thus, Thomson offered a 6x6-inch cathode screen, i.e. an area one third larger than the present best performing screens. "But above all," Maurice Bernard went on, "we integrated the two usual instrument-panel subassemblies, the EFIS (Electronic Flight Instrument System) consisting of the cathode tubes, and the

ECAM (Electronic Centralized Aircraft Monitor), a small computer that monitors all other instruments and warns the pilot of any failure. That made up a total of six cathode tubes and five symbol generators. For the A320, we used a single system, the EIS (Electronic Instrument System), consisting of four tubes and three generators. The performance is the same, but weight and volume were reduced each by one third."

A leader in electronics, Thomson also had the benefit of the experience of Jaeger Avionics and Systems, which Alain Gomez's firm acquired earlier this year. For many years, Jaeger has been putting its expertise into practice in the field of electromechanical equipment--the most traditional type--several thousand units of which are flying on the Airbus, Boeing, Lockheed, etc. The French tandem can now claim to be a major competitor in its specialty: its avionics sales should reach FF 4 billion in 1984. "We are planning to take on all the markets; Thomson is ready to answer all invitations for tenders, including for the avionics of the future Boeing, should the case arise," Maurice Bernard stated ambitiously.

#### Expected Decisions For Other French Equipment Manufacturers

Since good news never comes alone, Thomson was also selected to supply another essential piece of equipment for the A320, the ELAC (Elevator Aileron Computer), one of the two flight-control subsystems. "At any rate, this is a world first," Maurice Bernard pointed out. "Actually, the A320 is the first civilian aircraft provided with digital electric controls!"

Other French equipment manufacturers are waiting for decisions that should be made before the end of the month. Obviously, certain negotiations among European partners in the Airbus project, aimed at altering the present workload distribution, have something to do with the delays in making decisions.

The German and English manufacturers, which were not particularly favored when equipment contracts for the A300 and A310 aircraft were distributed, would like to see the situation change in their favor now that the Airbus A320 is about to be launched.

As a result, SFENA [French Company for Air Navigation Equipment] is not sure of obtaining the contract for the other flight-control subsystem, despite its collaboration with the Bodenseewerk Geratetechnik [Constance-Lake Factory/Instrument Technology], nor the contract for the automatic pilot or, in particular, that for the laser-gyro navigation system; for all these contracts, SFENA is in fierce competition with the German division of Honeywell and the U.S. company Litton.

The answers to all these questions will be political rather than industrial...

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## CIVIL AVIATION

### FOKKER, BAE SET TO ENTER SMALL JET MARKET

The Hague ANP NEWS BULLETIN in English 11 Sep 84 pp 1-2

[Text] Farnborough, England, September 11--With the air travel business struggling out of recession, two European planemakers think they have spotted a lucrative slot in the market for 100-seat airliners.

At the Farnborough airshow which ended on Sunday, the Dutch firm Fokker and British Aerospace (BAE) were the only planebuilders offering the new class of passenger jet which they predict will become one of the most sought-after airliners of the next 15 years.

They said world airlines may need as many as 1,000 of the 100-seaters by the end of the century.

At present there is no sign that Boeing, McDonnell Douglas or Airbus, the heavyweights of the industry, are going to move down from their bigger planes to make airliners this size.

So Fokker and BAE, if their predictions are right, are set to share a market which at present-day prices could be worth at least 1.5 billion dollars.

Fokker's plane is the F-100, a longer development of the existing R-28 with two British Rolls-Royce engines mounted at the rear. Although it will not enter service until 1986, eight have already been sold to Swissair.

#### Ideally Suited

The British plane is the BAE-146, a stubby jet powered by four American Avco-Lycoming engines which give it a special ability to land and take off on short runways.

The BAE-146 first flew in 1981 as an 80-seater and was 'stretched' to take 100 people the following year. So far 16 have been sold, with a further 38 on order.

The two companies say their planes are ideally suited for the market, particularly the important U.S. market.

A relaxation of official controls on commercial flying in the United States has brought a proliferation of airlines, particularly on short- and medium-haul routes.

More carriers mean more competition and this means fewer passengers per plane. To fly economically the airlines need smaller planes. Moreover, the signs are that the most buoyant sector of the U.S. and European markets is business travel.

More executives are travelling by air and they want more routes preferably serving airports near to city centres. They also want short-hop services to take them from smaller centres to major airports where they can take long-distance flights.

All this, Fokker and British Aerospace say, adds up to a bright future for their planes, which are smaller than the 130-seaters offered by the big planemakers.

#### Break-even Point

With competition growing and smaller cities opening up to air travel, they say the future lies with the small plane.

BAE Director John Glasscock says: 'We see the airlines moving down to our size of plane. I don't think they are buying bigger planes and hoping the business will grow to fill them. They are buying planes they know they can fill.'

BAE broke into the U.S. market by selling six 146s to Air Wisconsin which wanted to upgrade some shorter routes from smaller propeller-driven planes to accommodate growing traffic.

It then sold 20 146s to Pacific Southwest for its commuter services on the U.S. west coast.

By contrast Swissair bought the Fokker F-100 for use on its quieter European routes and far off-peak service on busy routes.

'What we are offering is something completely new. It can be the biggest plane for the small airline and the smallest for a big one,' says Fokker spokesman Gerd Knook.

While Fokker and BAE estimate the total market for 100-seat planes at around 1,000 by end of the century, most industry experts put the figure higher, perhaps even double.

The experts say the break-even point in each case will be around 300 aircraft. With the planes selling at about 15 million dollars a time, the potential rewards are enormous.



## CIVIL AVIATION

### BRIEFS

JAPAN MAY PARTICIPATE IN TA-11--Paris (Reuter)--Europe's Airbus Industry is currently seeking a Japanese involvement in a project for a new long-distance aircraft: the TA-11. As an Airbus spokesman stated, the firm is interested in cooperation with Mitsubishi, Fuji Heavy Industries and Kawasaki. The project, he said, has not yet advanced beyond the study phase. No decision has been made yet to build the long-distance aircraft. It was not announced how large the sought-after Japanese involvement in the TA-11 project might be. The jumbo TA-11 aircraft is intended for low-fare, long-distance routes. It will have four engines and is designed for 200-300 passengers. The TA-11 is to have the fuselage of the A 300/310 model. The wing will be of a new design. The FRG, France, Great Britain and Spain are partners in Airbus Industry. [Text] [Munich SUEDEDEUTSCHE ZEITUNG in German 24 Aug 84 p 25] 9992

CSO: 3698/619

## COMPUTERS

### FRENCH FORM RESEARCH TEAM FOR ARTIFICIAL INTELLIGENCE

Paris ELECTRONIQUE ACTUALITES in French 14 Sep 84 p 4

[Article signed H.P.: "Operational in Grenoble in 1985: An Intelligent Machine Institute To Tackle the Third Industrial Revolution"]

[Text] Intended to become one of the leading research centers in the world in a technology that will become tomorrow the basis of industrial power, an Intelligent Machine Institute (IMI) is now being set up at the INPG (Grenoble National Polytechnic Institute). Covering four disciplines, the IMI will combine long-term research and activities oriented toward the industry.

The IMI will employ 150 researchers coming from several INPG laboratories. To date, three laboratories have been installed on part of the 3,500 m<sup>2</sup> allocated to the IMI on the premises of the Grenoble Institute. These are the Research Group on Computer Architecture and VLSI [Very-Large Scale Integration] Design, which will employ some 40 people; the Voice Communication Laboratory (LCP) with 40 researchers; and the LTIRF (Image-Processing and Form-Recognition Laboratory) which would consist of 25 researchers. These teams could start working as scheduled in 1985, when the Institute becomes operational. Around the end of that year, the LIFIA (Basic Information and Artificial Intelligence Laboratory), headed by Professor Jorrand, will move into its premises at the INPG.

#### Private-Sector Financing

Furnishing the laboratories and purchasing equipment will represent an initial investment of FF 35 million. The IMI is supervised by the Ministry of National Education and receives two thirds of its resources from the public sector, in particular from the Ministry of Culture, which is interested in using artificial intelligence to produce synthetic images, and from the Ministry of Industrial Redeployment. Private or parastatal firms will provide the remaining third. Mr Jorrand, who is responsible for preparing the IMI research program, would have liked to see a greater participation of the latter but, to support an activity that, after all, is essentially oriented toward research, it seemed preferable to have most of the financing provided by the state.

Apart from basic and applied research and education, a major objective of the IMI will be to disseminate the results of its activities among industrial circles, to enable France to contribute under the best possible conditions to the "third industrial revolution." With this in view, the Institute will be equipped with a documentation and assistance center designed for firms. For its part, the LIFIA has already undertaken activities geared to the industry, in the field of computer-integrated manufacturing. Thus, a development contract for a self-teaching mechanical assembly system was signed with manufacturers in the automotive sector. However, such a system will not find any immediate application, but could be used in future workshops. Another application intended for the data-processing industry involves the spatial localization of variously colored conductors forming a single strand, which must be crimped; the system uses a camera and an image-processing device.

### "Grey Matter" Transfer

The transfer of technology is also accompanied by a transfer of "grey matter" from the laboratory to the industry. And the head of the LIFIA expressed the wish to see a proliferation of firms created by former researchers, like the ITMI [Intelligent Machine Industry and Technology]. As is known, this firm, created late in 1982 by two researchers, is now developing the GTR [expansion unknown], a processor used as a basis for image-analysis systems that could find many applications in the mechanical industries.

The intelligent machine on which the IMI is going to work for the next 10 to 15 years will include an increasing number of VLSI circuits for processing, thus decreasing the relative part ascribed to software. The reason is speed, considering the amount of data to be processed and the number of operations to be carried out. Therefore, the development of VLSI circuits will be one of the orientations of the Institute's research. The team in charge of this task will design a machine using the Prolog language. The program will serve two purposes: to acquire expertise in artificial intelligence, and to create a machine that will constitute a tool for the LIFIA. This will be the fifth-generation computer.

In the field of robotics, the IMI will have a center provided with powerful means; it will be used to experiment with programs in the context of cooperation with the industry. The themes supported by this activity will cover the issues raised by robotics: control, programming, visual perception, expertise with the tactile sense, modelling of reasoning and geometric modelling. For the LIFIA, however, robotics experimentation will constitute only the emergence of intelligent machines to "intelligent" robots [as published].

Jointly with the LCP, the IMI will tackle the problems raised by the use of voice for communication, and especially phonetics. As for the LITIRF, it will develop algorithms and specialized high-speed processors for image processing, texture analysis, vision and form recognition, and it will also carry out research on neuronics applied to parallel processing for form recognition.

## COMPUTERS

### NORWAY'S NORSK DATA CONTINUES STRONG GROWTH

Oslo AFTENPOSTEN in Norwegian 29 Aug 84 p 32

[Article by Ulf Peter Hellstrøm: "Norsk Data Takes Market Shares"]

[Text] Norsk Data has doubled its profits to 50 million kroner in the first half-year. Business receipts increased by 63 percent and passed 503 million kroner. This is a very big advance, which must be viewed in light of the fact that the computer company traditionally experiences especially strong growth in both sales and, not least, profitwise, in the second half of the fiscal year.

The computer company, which now employs nearly 2000 people, can this year have sales of 1.3 to 1.5 billion kroner, a profit of about 250 million, and a profit after taxes of around 20 kroner per share.

Business receipts in the first half of the year have for the last few years been a good third of the company's annual sales. Profits before extraordinary items in the first half of the year have not constituted more than a scant 20 percent of annual profits. This shows an uneven distribution between the company's revenues for the first and the second halves of the year, while costs are more evenly distributed. Norsk Data's board of directors points out that profits for the second half of the year in 1984 are expected to be considerably better because of a higher delivery volume for the company's products.

Norsk Data has been maintaining an annual rate of growth of 40 percent and then some, and is thereby taking market shares in a market which is scarcely growing more than 20 percent per year. The receipt of orders has increased by 65 percent in the first half of the year, to 622 million kroner.

Norsk Data experienced a slight decrease in its operating profit margin in the first half of the year because of lower margins on the products which the company took over through the acquisition of the West German Dietz computer company last year.

The company has budgeted on the basis of a substantial increase in production and volume of deliveries for the second half of the year this year. Because of a larger receipt of orders than anticipated in the budget, together with big contracts with the Telecommunications Agency and the American Hughes

Aircraft firm in the first half of the year, the company now estimates an extra increase over that budgeted for the second half of the year.

Norsk Data has also asked the Commerce Ministry for permission to increase above 50 percent the percentage of voteless B shares. The company also wants to do away with the restriction on the element of foreign shareholders among owners of B shares, so that the only restriction will be that a majority of A shares must continue to be in Norwegian hands. This is an expression of the fact that the company wants an opportunity to make use of foreign capital markets during its continued expansion.

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CSO: 3698/617

## COMPUTERS

### NORWEGIAN COMPANIES TO SUPPLY ADVANCED ELECTRONICS TO ESA

Oslo AFTENPOSTEN in Norwegian 10 Sep 84 p 29

[Article by Ulf Peter Hellstrøm; "Norwegian Satellite Commissions"]

[Text] Norwegian industry will receive commissions for a total of 27 million kroner for future orders for the ESA European space organization's first experimental satellite for telemetry, the ERS-1. This is clear after the government has now decided that Norway will participate in this European telemetry program.

The government believes also that it should be an objective that the Tromsø telemetry station receive and process all data from these radar satellites. Complete expansion will cost 40 million, and the expansion will be able to take place gradually, the government thinks.

Norway's decision in principle to participate in the telemetry program means that Norway will pay about 40 million kroner, or 1.28 percent, of the total expenses, distributed over the years 1984 to 1990. Norway's acceptance of the agreement with ESA is conditional on the Storting's approval.

Industry Minister Jan P. Syse says in a commentary that participation in ERS-1 is of great industrial interest. He points out that Norwegian firms will supply advanced electronic and computer equipment, something which in turn will provide opportunities for further technological development and later orders for other satellite systems, too. The cabinet minister points out also that Norway will benefit considerably from radar satellites of this type, both for research and surveillance of the large ocean areas within the economic zone.

The Norwegian contracts for the first radar satellite concern a special instrument based on so-called acoustic surface wave technology, Norwegian Technical and Natural Sciences Research Council (NTNF) Department Head Bjørn Landmark tells AFTENPOSTEN. He heads up NTNF's space operations department. It will be the Aksjeselskapet Mikroelektronikk [Microelectronics, Inc.] (AME) in Horten which in cooperation with ELAB in Tromsø will develop and supply this instrument, and the commission will amount to 13 to 14 million kroner.

The other commission concerns partly orders for Norsk Data's minicomputers, and partly the development of special software for an ESA station in Sweden,

which will interpret the digital signals from the satellite. The latter contract will, apparently, go to Informasjonskontroll A/S and Drive Electronics in Tromsø. This second commission, too, is a question of a total of 13 to 14 million kroner.

The European telemetry project which the countries in ESA have now accepted, will cost a total of about 3.5 billion kroner. Norway is an associate member in ESA. Both the question of the expansion of the Tromsø telemetry station and participation in the telemetry program will be presented to the Storting in a separate bill for the fall.

Concomitantly with the Norwegian commissions for ERS-1, the Armed Forces Research Institute (FFI) is continuing its big project to develop an extremely fast computing facility based on a number of processors which work together. This project is continuing on a national basis. Such a computer will be able to process signals from the future's radar satellites, for example, so quickly that the information can be used in surveillance tasks on land and, not least, at sea.

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## COMPUTERS

### BRIEFS

BULL, NEC COMPUTER AGREEMENT--Paris--On Wednesday, August 22, the French company Bull and the Japanese company NEC signed commercial and technical cooperation agreements in the large-computer field, following the agreement of principle reached in March. The agreements grant Bull manufacturing and distribution rights for NEC's high power processor S-1.000 and its successors; NEC is one of the leading Japanese computer manufacturers. Beginning in 1986, the S-1.000 will be integrated in Bull's computers to complement at the top of the line, the DPS-8 and DPS-88 computers already being sold by Bull. NEC considers that this agreement "joins Bull's experience in systems, and the efficiency of its sales network, to NEC's advanced technology." In turn, Jacques Stern, chief executive officer of Bull, points out that this association will make it possible "to offer customers high performance solutions in answer to their requirements for higher power." The agreement is equivalent to the one reached between NEC and the American company Honeywell, which controls 8 percent of the capital of CII-Honeywell Bull, a unit specialized in large systems as part of Bull. [Text] [Paris AFP SCIENCES in French 23 Aug 84 p 37] 11,023

CSO: 3698/615



## FACTORY AUTOMATION

### CGE OF FRANCE IN COMPUTER-INTEGRATED MANUFACTURING MARKET

#### Firms, Technologies Involved

Paris L'USINE NOUVELLE in French 6 Sep 84 p 28

[Article by Philippe Douroux]

[Text] Alsthom-Atlantique, CGEE-Alsthom [General Electrical Equipment Company-Alsthom], Cilas, CIT-Alcatel... Their roles are defined and CGP [General Production Management Company] becomes the CIM [computer-integrated manufacturing] "prime contractor." The industrialists have yet to be convinced of the advantages of this more fully integrated system approach before venturing into the marketplace.

CIM had already scrapped the organization charts of General Electric, Renault and Siemens. In creating the CGP, the CGE [General Electric Company] has brought itself in line with the current vogue. The CGP, 60-percent controlled by the CGE, has taken over the activities of the CGMS [General Materials Handling and Warehousing Company], previously a subsidiary of Alsthom-Atlantique. And orders are to be handled by Georges Mercadal, who, in June, was appointed president of Sogelberg, an engineering subsidiary of the CGE group.

Grafted onto this hard core will be two teams brought over from CIT-Alcatel to contribute their expertise in the GPAO [computer-aided production management] and industrial networks fields. In exchange, CGMS, which has been marketing Sankyo's Skilam and Toshiba's Tosman assembly-line robots, will cede its licenses to the new robotics division of Alsthom.

Divested of CGMS, the group headed by Jean-Pierre Desgeorges thus finds assigned to it CGE's economically pivotal robotics activity. Jean-Francois Dacier, head of Alsthom's robotics activity and vice president of CGP, will head CGE-Alsthom coordination. Roles have thus been clearly defined.

The flexible workshop line will bear CGP's trademark, but the robots will bear that of Alsthom-Atlantique. The monitoring and regulation of continuous processes (chemical, petrochemical) will be the provinces of CGEE-Alsthom. Automation system components (sensors, industrial lasers) will be developed

by Cilas, a subsidiary of CIT-Alcatel. And CIT, through its subsidiaries CGA [General Automation Company], GSI [General Data Processing Service Company] and TITN [Information Processing-New Techniques], takes over industrial data processing. CGP will handle the integration of all these components for the designing of 100-percent-CGE flexible workshops.

Initial foot-dragging having been eliminated, the group is now marching in lockstep, without the benefit, however, of any mappings of the battlefield. Although GPAO, robotics and even industrial networks represent markets that have been thoroughly explored, CIM remains a vague concept for industrialists. "The need exists, but not yet the market," says Georges Mercadal. "The users have yet to be convinced of the advantages of a more fully integrated system approach to the automation of production." The first step: Automation of the CGE group itself, following the example of General Electric, which has spent \$3.6 billion since 1980 to automate its own shops. In its Erie locomotives plant alone, \$500 million are to be invested between now and 1985 to build the "workshop of the future."

CGP has already had a first experience, with the Aytrel flexible workshop built by CGMS for Alsthom-Atlantique's Railway Division. Aytrel completed, CGP must study different projects in fields as varied as mechanics for Alsthom-Atlantique and electronics for CIT-Alcatel. As a prerequisite to embarking on a course of competition in the open market, the group is looking forward to receiving its first orders within the next few months.

Following a year marked, for the new CGP, by a sharp drop in its activity (202 million francs versus 262 million francs in 1983) and a negative profit and loss balance of 18 million francs, 1985 is expected to be, for its 400 employees, the year of turnaround and rebound the company needs prior to making its entry into the domestic and European integrated industrial automation arenas.

#### Investment, Personnel

Paris AFP SCIENCES in French 30 Aug 84 p 30

[Excerpts] Sixty percent of the capital stock in CGP is owned by CGE and 40 percent by CGE's subsidiary Alsthom-Atlantique, but this configuration is "open to participation by outside partners, French and foreign, from the standpoint of capital as well as that of industrial cooperation," the CGE has indicated.

The new entity, which will employ 450 persons (including 70 in engineering), and more than 500 within the next 3 years, is structured around four main industrial product lines which CGE has already set up: Automated systems (Alsthom-Atlantique), industrial process control (CGEE-Alsthom), CAD [computer-aided design] (CIT-Alcatel), and components (Cilas, SCEMI, ACB and PARVEX).

Mr. Mercadal, president of Sogelberg, has been named CEO [chief executive officer] of CGP. He will be assisted by Mr Dacier, vice president, and Mr Bondoux, general manager and administrator.

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## MICROELECTRONICS

### NETHERLANDS' PHILIPS RELEASES BALANCE SHEET FOR JAN-JUN 1984

#### Profits Double

Rotterdam NRC HANDELSBLAD in Dutch 16 Aug 84 p 1,9

Text Rotterdam, 16 Aug--Philips has earned 544 million guilders in the first 6 months of this year and thereby doubled its net profit. In the first half of 1983 the profit amounted to 259 million. Philips made these figures public this morning.

In an explanation of the figures the management expressed the hope this morning that a turnover of 50 billion guilders can be obtained this year, 10 million more than last year. From the standpoint of volume, turnover increased 9 percent in the first half year. The increase in value was much higher in the first half year, 17 percent. Six percent of the increase in turnover in value consisted of price increases and changes in the rate of exchange.

All product groups contributed to the improvement. The industrial supply group showed the best results. Integrated circuits, semiconductors and color TV picture tubes were the most desired products. The lighting and battery sector also showed increased turnover, just as the household appliance division. The latter group especially increased turnover through the merger with Bauknecht on 1 May 1984, whose still remaining shares Philips bought up during the year. Many microwave ovens were sold.

The TV and sound sector showed a negative result. The management calls this sector difficult.

As a result of strong economic growth and the high exchange rate of the dollar, turnover increased considerably in the United States and Canada. Sales also increased strongly in Asia. The development of turnover in Europe remained behind the enterprise's average, because of smaller consumer expenditures.

# Philips Financial Report

Amounts in million guilders	First half year	
	1984	1983
Turnover	24,173	20,663
Business results	1,634	1,109
Financing correction	296	322
Financing expenses	-931	-905
Extra assets and liabilities	6	32
Profit before deduction of taxes	1,005	558
Taxes on profits	-452	-279
Profit after deduction of taxes	553	279
Share in the net result of unconsolidated participations	69	33
Minority interest of third parties	-78	-53
Net profit	544	259
Business result in percent of turnover	6.8	5.4
Profit before deduction of taxes in percent of turnover	4.2	2.7
Profit after deduction of taxes in percent of turnover	2.3	1.4
Net profit in percent of own capital	7.8	4.0
Net profit per common share of 10 florins (in guilders)	2.58	1.28
Same on basis of historic costs g.a.a.p. [expansion unknown]		
per common share of 10 florins (in guilders)	3.19	1.63
End of June	1984	1983
Inventories (in percent of turnover in the last 12 months)	30.7	31.3
Average credit term of business debtors (in months)	2.3	2.5
Liquid funds	1,262	1,036
Foreign capital as percent of total capital	60.4	58.7
Employees (comparable situation on 1/1/1984: 341,000)	343,900	341,200
Of which in the Netherlands (comparable situation on 1/1/84: 67,500)	67,600	72,100

In this report the consolidated figures of Philips Ltd. light bulb plants and those of the United States Philips Trust are combined.

## Research Personnel Hired

Rotterdam NRC HANDELSBLAD in Dutch 17 Aug 84 p 11

/Text/ Eindhoven/Amsterdam, 17 Aug--For the first time in a long time in the Netherlands, the number of personnel at Philips has increased, in which it is noteworthy that specialists, especially in the field of advanced technology, among others for research, were and are still being employed. About 500 people will be added in that field this year.

Since the end of 1983 the balance of departures and employment was about 100 people in the Netherlands, as a result of which the total is now 67,600 at the end of the second quarter, while throughout the world Philips personnel has risen from 341,100 to 343,900.

The results of expanded research and innovations will be seen next month in a number of new or far-reaching improved products for the consumers at the Firato, reported Philips Vice-President C. J. van der Klug, during the presentation of the quarterly report for 30 June in Amsterdam.

Of further interest in this respect is that Philips is beginning to win over Japanese competition in the United States, while its own sales in the Far East have improved by means of a central regional firm bureau in Tokyo. Worldwide cooperation with AT&T "is working well," although obtaining orders (the government is the only customer) is a rather difficult problem: there are orders from the Netherlands, Colombia and Finland.

## Image and Sound

Philips is not yet satisfied with the still rosy-red figures in the field of image and sound; radio, television and such. Still it appears that the second half year will see an improvement, but Doctoral Candidate J. Zantman of the board of directors did not venture to promise whether the final red figures will disappear at the end of 1984.

It appears certain that achieving a turnover of 50 billion guilders and a profit of a billion guilders is not impossible by a long way after the profit increase (after taxes) by 98 percent to 553 million guilders. Moreover that increase in profit was (just as, for that matter, was the case with the turnover) a slight decline from the trend in the first quarter, when profit increased 129 percent and turnover by 19 percent.

The present turnover with 12.1 billion guilders for the second quarter is an increase of 15 percent, compared with the corresponding quarter of 1983, which yields a 16 percent increase in turnover to 24.2 billion for the half year.

Moreover, on the basis of this rather slight decrease, the stock exchange was not so impressed with the figures and the price of a share had to drop somewhat.

According to Philips' bookkeeping methods (replacement value), the profit per share has risen, it is true, from 1.28 guilders to 2.58 guilders, but it rose higher in the United States.

In the United States where the profit per share was calculated on the basis of historic costs, the rise in the first quarter was not very spectacular, but for the second quarter and consequently for the first half year, there was a rise there from 1.63 guilders to 3.19 guilders.

It is considered possible that as a result, the interest of American investors will again increase. They still had about 24 percent of Philips' shares at the end of 1983, but now have 20 percent.

The American Philips' enterprises did especially well in the second quarter. In addition, the Olympic Games in Los Angeles encouraged sales in several countries--including also the Netherlands. There is still little economic recovery noticeable in Latin America and Europe: In Europe, Philips must compete in the Netherlands, the FRG and England. Industrial supplies especially, which are very sensitive to the economic situation, have done well, while, among others, household appliances did somewhat better.

#### Bauknecht

In the field of household appliances, Philips is now the 100 percent owner of Bauknecht, but they will not tell what was paid for it.

The Bauknecht affair certainly influenced the balance figures, so that among other things, financing with foreign money rose somewhat from 58.7 percent a year ago to 60.4 percent now, but that will be a transitory phenomenon.

Meanwhile, there was great reorganization at the German firm, while it contributed to an increase of turnover in household

appliances. The concern has been consolidated in Philips' figures since 1 May. The resulting increase in the balance figure was about half a percent. In general, the figures rose as a result of consolidations, in the case of profit by 2 percent, while through foreign exchange, turnover increased by 3 percent and through greater volume of sales by 9 percent, so that about 4 percent of the increase in turnover was a result of better prices in a number of countries, in which sales in the United States exceeded all expectations.

Philips cannot foresee how much further it will go in the second half of the year, but the third quarter has done well so far.

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CS0: 3698/613



## MICROELECTRONICS

### BRIEFS

JAPANESE-ITALIAN CONTRACT--Milan--Montefluos, a subsidiary of the Italian privately-owned chemicals group Montedison specializing in fluorine products and special-purpose liquids, signed a novel cooperation agreement with the Japanese chemicals firm Asahi Glass, in Tokyo on Friday 24 August, according to a spokesman for Montedison. Under this agreement, the Japanese firm undertakes to begin, as of year-end 1985, in a plant located at Kiba (near Tokyo), regular production of Fomblin, a special-purpose liquid used by the manufacturers of semiconductors and electronic equipment, as well as in magnetic, electromechanical and nuclear industries. Fomblin is a patented Montedison product and the Japanese firm's entire production will be sold to Montedison, which in turn will sell it on the Japanese market. What is innovative about this agreement is that, under it, Montedison can, within a few years, become the owner of the Kiba plant by paying Asahi Glass for its Fomblin production at a price higher than its actual production costs. Last year, Montefluos's revenues totaled \$216 million, yielding a net profit of \$3.6 million. The group presently has four production plants in Italy. [Text] [Paris AFP SCIENCES in French 30 Aug 84 p 10] 9238

CSO: 3698/623

## SCIENTIFIC AND INDUSTRIAL POLICY

### R&D FUNDS INCREASED 7 PERCENT IN 1985 FRENCH FINANCE BILL

Paris AFP SCIENCES In French 13 Sep 84 pp 2-3

[Article: "7.3-Percent Increase Of the R&D Budget Allocation For 1985"]

[Text] Paris--The 1985 finance bill introduced at a Cabinet meeting on 12 September shows that research and development remains one of the government's priorities: whereas the overall budget is severely limiting the growth of public expenditures, the total allocation for research and development, including tax credits, shows a 7.3 percent increase over 1984. Six hundred jobs are created in research institutions.

The Cabinet communique containing this information stresses that "the determination to modernize is reflected, among other things, in the growth of the amounts allocated to industry and research." Capital contributions earmarked for public-firm investments will amount to FF 15.2 billion.

In absolute figures, the budget bill provides for total allocations to the civilian research and development budget amounting to FF 38.861 billion for current expenditures and program authorizations (compared with FF 36.835 billion in 1984), i.e. a 5.5-percent increase. For payment credits, it provides for FF 36.707 billion compared with 34.147 billion in 1984, i.e. a 7.5-percent progression [figures as published].

As for job creations, a very sensitive item, in addition to the 600 mentioned in the Cabinet communique (including 64 ITA [expansion unknown] creations), there will also be 408 integrations of non-status personnel.

Calculations show--if we are not mistaken--that the rate of research-job creation will reach the 3 percent projected in the LOP [expansion unknown].

There are reasons to believe that, in the 1985 budget bill, mobilizing programs (essentially electronics and biotechnologies) and--although to a lesser extent--basic research are given priority over other sectors.

From a well-informed source, we also learned that space programs will benefit from a growth of close to 11 percent.

The priority thus decidedly given to research and development can be illustrated by a comparison with the overall state budget. As is emphasized in the 1985 finance bill, the amount of the budget deficit will remain within 3 percent of the gross domestic product. In view of the voluntary moderation of state receipts, achieving this goal will imply a considerable effort to control expenditures. In 1985, the latter will increase by 6 percent, i.e. less than the national wealth (+ 7.5 percent).

Within this total, "current" expenditures will increase by 4.5 percent. Current operating expenditures, i.e. the state's lifestyle, will as a rule decrease by 2 percent. In the context of a "progressive return to an independent and balanced financial position of the public sector," expenditures for state interventions will increase by only 3 percent. Finally, payment credits for equipment expenditures will increase by 6.5 percent, "making it possible to sustain a considerable investment effort."

Mr Hubert Curien, minister of research and technology, will provide more detailed information on the 1985 research and development budget at a press conference scheduled for Friday 14 September.

AFP-SCIENCES will have a report in its next issue.

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CSO: 3698/15

## SCIENTIFIC AND INDUSTRIAL POLICY

### BRIEFS

DENMARK 1985 R&D FUNDS--Copenhagen--On 15 August, Denmark's minister of finances, Palle Simonsen, indicated to Parliament while presenting the 1985 budget, that the government's objective was to erase the deficit by the end of the 1980's. The deficit of this new budget should amount to 42 billion krone (about \$4.2 billion), with total expenses reaching 191.4 billion krone and income 149.4 billion. Within this budget, the government plans to release 5 billion krone to encourage initiative in technologic development, research, and education. Mr Simonsen estimates that the balance of payments deficit--evaluated at 12-15 billion krone for 1984--will be eliminated in three to four years, with 1984 being the 21st deficit in the balance of payments. At the end of last year, the the country's total foreign debt exceeded 185 billion krone. [Text] [Paris AFP SCIENCE in French 16 Aug 84 p 8] 11,023

CSO: 3698/615

## TECHNOLOGY TRANSFER

### SWISS AMBASSADOR ON COCOM RESTRICTIONS

Zurich DIE WELTWOCHE in German 23 Aug 84 pp 25,27

[Interview with Ambassador Franz Blankart, delegate of the Federal Executive Council for trade agreements, by Felix Mueller of DIE WELTWOCHE, place and date not specified]

/Text/ The efforts of the Reagan administration to make more stringent the technological boycott against the Eastern Bloc is beginning to have perceptible effects on the Swiss economy. Recently, Cocom (Coordinating Committee for East-West Trade Policy) - an agreement made in 1951 during the Cold War Period, which supplemented the military defense measures by strategic economic ones - has renewed its embargo list. At the same time, the U.S.A. made the procedural directives more stringent. Since that time, companies which use American parts in their products have found it even more difficult to obtain export permits for their domestic and foreign branches. Switzerland abides by the Cocom regulations voluntarily. But its room for maneuver is very limited if it does not itself want to become a victim of American boycott measures. This situation raises misgivings in connection with national sovereignty which are additionally nourished by incidents of a similar type, e.g. in relation to France.

Ambassador Franz Blankart has been the delegate of the Federal Executive Council for trade agreements since May 1984. In this function he is in particular also responsible for economic relations with the U.S.A. According to his own statement, he considers the problem of preserving Swiss economic sovereignty "currently at the very center."

WELTWOCHE: To export particular products, one must obtain an export license from the EVD (Federal Department of the Economy). How is that at all possible legally, and what is the point of this regulation?

Blankart: By subjecting certain goods to an export permit, we pursue two objectives: The first point is to provide a credible guarantee to Swiss supplier countries, which check up on the final disposition of goods delivered by them, that these goods are not transferred from Switzerland to countries whose deliveries they wish to prevent or at least restrict by their control measures. Since the introduction of joint export controls by

the U.S.A. and its allies in the year 1951, this guarantee forms an important precondition that as unrestricted and nondiscriminatory access as possible to western technology is assured to our industry.

The second category of goods that are subject to export permits includes products where the economy of the foreign country is such that, with a free export regime, there would be a risk that these goods would flow off into these countries and their supply in the Swiss economy would become unavailable or too expensive. Among these goods are processing wastes and scrap containing iron, steel, nickel, as well as raw wood.

The obligation to obtain an export permit is regulated in a Parliamentary ordinance. This ordinance is based in the federal law concerning foreign trade. The ordinance concerning the export of goods and the associated decrees were most recently revised in March 1983. The revision was approved by the Parliament together with the report on foreign economic policy of August 1983.

WELTWOCHÉ: The list of the "ordinance concerning the export of goods" at the moment comprises 139 items. Do these correspond integrally to the Cocom list or are other products included as well?

Blankart: The NATO countries and Japan have joined together in the so-called Cocom. Among other things, they have agreed to a list of goods which, in view of their military significance, may not be delivered to members of the Warsaw Pact. By implementing this embargo, they allow export of such goods only to western countries and even then only in return for a guarantee of final retention. This is the decisive element. It follows from this that these goods are included in our export controls, since only in this way can we provide a guarantee for final retention, without which our businesses could not procure such goods from the Cocom countries. It is understood that the Cocom countries will subject only such goods to the embargo for which there exists a technological lead. The list comprises goods without which a modern industry like our own cannot function.

WELTWOCHÉ: Will products that are produced purely in Switzerland (without any foreign components) also be subjected to the licensing obligation?

Blankart: To make sure that goods imported with a final retention and guarantee cannot circumvent the controls by being mislabeled as a Swiss product, since 1951 all products in the export list have been subjected to the need of a permit, that is also those of Swiss origin.

The export control that is intended by imposing the obligation to obtain a permit simultaneously serves to implement the traditional Swiss practice, motivated by political neutrality, not to circumvent trade restrictions from other export countries by deliveries from Switzerland. We intent to prevent on an autonomous basis that Swiss exports develop towards countries which are subject to commercial-political sanctions on the part of third-party states, in such a fashion that they exceed the framework of previous customary exports.

WELTWOCHÉ: Why has Switzerland joined the Cocom embargo?

Blankart: The statement that Switzerland has joined the Cocom embargo is completely inappropriate. A collaboration of Switzerland with Cocom would not be compatible with our neutral political obligations. The measures taken by Switzerland have as their sole and only point on the one hand to secure our industry's supply with goods without which it cannot survive and, on the other hand, to implement our political maxims of neutrality, not to circumvent the embargo measures of other countries by substitute deliveries. The Cocom embargo incidentally should not be overestimated quantitatively. As the trade volume of individual Cocom members with the Eastern Block states indicates, the embargo does not stand in the way of quite considerable trade. We too maintain our trade relations true to our principle of universality. On the basis of economic conditions and needs, trade with Comecon, however, makes up only a few percent of our total exports.

WELTWOCHÉ: Was pressure exerted on Switzerland to join the Cocom Association?

Blankart: No! Our country is always informed by the governments of the Cocom countries for which goods a new final retention declaration must be provided of which goods have been dropped from the obligation to obtain a permit. The point of these contacts is to make sure that new controls or directives with respect to third parties do not jeopardize the smoothest possible execution of mutual trade.

WELTWOCHÉ: Swiss companies must fill out forms from the U.S. government to provide an accounting concerning their trade relationships. This allows the U.S.A. to have a partial insider view into our trade relations. Is such a procedure not questionable in terms of national sovereignty?

Blankart: Our autonomous export control system intends, among other things, precisely to avoid that Swiss companies will have to subject themselves directly to American law. Only if the goods do not remain in Switzerland but are reexported do they require approval from American agencies. One cannot expect from the U.S.A. (as also from the other Cocom members) that they will prohibit their own companies the export to embargo countries but on the other hand will allow foreign receivers every and any freedom to dispose of goods of American origin. The procedures for reexport approval, which are prescribed by American agencies, are limited strictly to this aspect and demand no further information concerning the trade relations of Swiss enterprises.

WELTWOCHÉ: At the moment, one can observe an increasing trend of foreign institutions and governments to apply their legal standards also to areas of Swiss jurisdiction. In particular this concerns the U.S.A. and France. How do you judge this development?

Blankart: This development is a cause for worry. But it would lead to far to discuss the problems here which occupy us in relation to the U.S.A. and France. Speaking generally, however, here too one has to consider the fact

that what is frequently involved is the effect of legal standards by means of which a country regulates a behavior which largely takes place on its own territory or which affects its legitimate interests. Such legal standards frequently also have effects on companies that operate internationally. This is primarily the consequence of economic interlinkages and not necessarily of exaggerated claims of dominion of individual governments. In case of such legal conflicts, one must always seek solutions which take into account the various interests of the affected countries. Cooperation here too serves all parties better than confrontation.

WELTWOCHÉ: Do you deem the objection of Swiss economic groups as justified, that the Cocom list supposedly serves in no small measure to screen U.S. companies from foreign competition?

Blankart: The American export control directives are stricter than the Cocom standards, and we have no specific reference points that the U.S.A. is using its export control policy to pursue the objective of hampering foreign competition and thus clearing a preferential position for its own companies. The American businesses, quite on the contrary, complain that, in comparison to their foreign competitors, they are at a disadvantage because of the strict American export controls.

Export controls and embargoes, however, generally act as a hindrance for the development of international trade. As a consequence of the security policy of individual countries, such measures are unfortunately not always avoidable. In any case, it should be possible, and our efforts strive in this direction, that, among countries which have close relations as trade partners, the administrative effort is kept as low as possible and no discrimination is created.

WELTWOCHÉ: Where must Switzerland place its limits in defending itself against attempts at influence? What means of exerting pressure does Switzerland actually have?

Blankart: The limit is set by our policy of neutrality. Inversely, it is in our interest to avoid making a profit by circumventing the embargo measures of third parties, i.e. in a fashion that is unjustified in terms of competitive policy. In the area of the Cocom embargo, we have not been subjected to any attempts of pressure to relinquish our maxims. Incidentally, I would like to state emphatically that the embargo problem for us is neither new nor specific to the U.S.A. It should also be pointed out that other countries subject their strategically significant technology to a nearly total export embargo. Despite all hindrances, Switzerland lets itself be governed by the principle of the universality of its economic relations. In view of the repeated attempts to subject foreign trade to political objectives, this principle is now more important than ever.



## TECHNOLOGY TRANSFER

### FRG TECHNICAL INFORMATION CENTER OFFERS COMMERCIAL DATA BASES

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 10 Sep 84 p 16

/Text/ Technical Information Center e.V. (a registered association) Frankfurt. Data bases which have stored the technical, scientific, and commercial knowledge of our time are becoming more and more important in international competition. Due to microelectronics and telecommunications, due to more and more sophisticated methods of software specialists, they are now becoming increasingly multifaceted, and in addition are constantly opening up new application areas. Data bases thus become an important transmission belt of technical-economic development. Scarcely a day passes in which a new data base does not arise somewhere in the world. Most of them, however, are produced in the United States. The worry of many experts therefore is not unfounded that the highly developed economy of the Federal Republic could one day become severely dependent on American data bases. Already today, it can be observed that these data bases contain only inadequately the research results from German colleges and the technical developments of German enterprises.

In the meantime, the significance of data bases for competitiveness in the economy has also been recognized in the Federal Republic. The state of knowledge in industry and in the universities has happily risen, according to Wolfgang Müller, in an interview with this journal. Mr. Müller is manager of the Technical Department of Machine Construction of the Technical Information Center. Data bases have for some time also been better utilized, even by small and medium enterprises. This is also of utility to the Technical Information Center which, according to its own data, is the leading German supplier of technical literature data bases.

This organization has existed for 5 years in its present form. It is supported by the Industrial and Engineering Associations, VDMA, ZVEI, VDE, and VDI. For years it has obtained funding means from the federal government and from industry, a total of 4.8 million DM in the past year. Receipts from data base and information services run to 3 million DM. This income is to be increased considerably during the coming years, but 100 percent self-financing will not be possible. Here one points to the constantly increasing work in the acquisition of literature. Just in 1983, 110,000 literature references were stored in the technical areas of electrical engineering and machine construction.

The Information Center offers data bases in the topic areas of machine construction, electrical engineering, chemical process engineering, plastics engineering, medical engineering, and motor vehicles. The first German full-text newspaper data base is valued as a special feature. Every edition of the VDI reports is entered into this data base. The "switch-on times" to all the data bases have risen 25.6 percent compared to the previous year, and sales have risen by 21 percent. The number of subscribers to the so-called online service, that is the number of clients which have direct access to the data bases of the Information Center, has risen within 1 year from 370 to 540. In a short time, new data bases are to be offered on the topics of business organization, business management, and business economy.

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## TECHNOLOGY TRANSFER

### EFFECTS ON AUSTRIA OF STRICTER HIGH-TECH EXPORT RULES

Vienna PROFIL in German 20 Aug 84 pp 25-27

[Article by H. Langsner: "High-Tech Blues"]

[Text] The Europeans are suffering at least as much as the East Bloc from Reagan's anxieties concerning technology.

The Swedes are quick to oblige. The LM Ericsson electronics firm quite voluntarily passed up a lucrative contract with the Budapest Government to equip the Hungarian telephone system with the most up-to-date digital technology. The company's headquarters in Stockholm explained that the U.S. Government would in any case refuse to grant the export permit for the needed electronic components to the American suppliers of Ericsson since, after all, it amounts to building a perfect communications system for an East-Bloc country. The Pentagon frowns on such things, and so it is wiser not even to try.

The Swedes were quick to understand that it is difficult to do business with communists since Ronald Reagan decided to deny Western high-tech as much as possible to the evil empire--at least when one is dependent on American suppliers.

This lesson is being learned more slowly in Austria. There the Kapsch and Schrack electronics firms are still hoping to jointly land the contact with Hungary that the Scandinavians turned down. After all, it would be a 2-billion-schilling deal.

The Austrians, however, have suffered a distinct setback. A week ago, the FINANCIAL TIMES reported that the Canadian company Northern Telecom, the license grantor of the electronic know-how for the Kapsch-Schrack partnership, had likewise prematurely withdrawn from the deal. This automatically signaled the end for the Kapsch-Schrack plan, for without the Northern Telecom license there can be no digital telephones for Budapest.

Although the information of FINANCIAL TIMES had not yet been confirmed officially and Schrack spokesman Helmut Reisenberger said that he could not "imagine that the Canadians would simply pull out," the surprise was ever so complete: at the very time that Ericsson pulled out, none other than Standard Electronik Lorenz (SEL), the German subsidiary of the U.S. company ITT, came

forth and presented itself as the most promising bidder now for the Hungarian deal. SEL will make the deal that the others turned down from the first for fear that Washington would prohibit it. The German Government will act as the go-between, said the confident SEL managers, and will obtain approval from the Americans.

Approval from the COCOM, to be exact. This international commission--made up of the NATO countries, minus Iceland and Spain, plus Canada and Japan--was set up by the United States to control the so-called technology transfer to the East. The decisions will be made here about whether the Hungarians get the telephone technology and who will supply it.

Indeed, Austrian Undersecretary Ferdinand Lacina himself intends to make a pilgrimage to the COCOM in Paris to plea for COCOM clearance for the Canadians--and consequently, the Austrians. But as a representative of a non-COCOM country, Lacina has little influence, and it seems that the groundwork has already been laid anyway.

Says a Schrack employee: "SEL will probably get the COCOM clearance, but we won't." The official justification for this unequal treatment would then be something like the following: SEL, as a quasi American company, is easier to control and therefore more trustworthy than the Austrians, who are suspect in any case.

If these dark inklings should turn out to be true, a rather nasty situation would result: whereas neutral Austria would have to sacrifice its business dealings to the political interests of the United States, an American company would reap an advantage.

Then the people at Kapsch and Schrack would have every reason to add their cry to the lamentations of numerous European industrial managers. For Reagan's concern that the damned commies will sooner or later conquer the free world with the help of Western knowledge, is causing a loss of billions to European industry and making it increasingly more difficult for the Europeans to remain competitive. The FRANKFURTER ALLGEMEINE, for one, calls the rapidly increasing export restrictions of the U.S. authorities "technology protectionism." All too often, U.S. companies are profiting from these restrictions.

It has been especially bad since March. It was then that the Americans discontinued granting the general licenses--valid for an entire year--for the export of the most important high-tech goods and began conducting a case-by-case approval process for each deal. And, like the best American chewing gum, this can be an extremely drawn-out affair.

If, for instance, an Austrian company buys an American computer, the Austrian Trade Ministry must first vouch for the company's trustworthiness and guarantee that the computer will not be sold to someone else. The American exporter then applied to the U.S. authority for an export permit--one for each separate delivery.

The result is that, whereas formerly computers or electronic components (above all, semiconductors) arrived within a few weeks, there is now at least a 6-month wait for every single part.

The Vax 780 computer built by Digital Equipment is an object of special concern. This extremely fast computer is exceptionally suitable for the guidance of rocket systems and thus arouses interest within the East Bloc. Just last February the Swedish police confiscated a Vax computer at the Halsingsfors Harbor which the German technology smuggler Richard Mueller was about to send to the USSR.

Since then, Reagan's enforcers have been on the lookout for shady deals everywhere. Americans turn up regularly at the Elin Computer Center to check that all the Vax computers are still there. There are similar checks at Mannesmann-Tally, a producer of computer printers. And even VOEST is not immune to American scrutiny. VOEST spokesman Franz Summer says: "We had to agree to these controls when we purchased the equipment."

The controls are of course to be regarded more as an ideological cowboys-and-indians game than true military-political chastisement.

Not only in Austria, so sharply criticized by the WALL STREET JOURNAL, but in Switzerland, Sweden and Finland as well, there are hundreds of import-export companies that supply any amount of contraband to the East Bloc.

The United States is reacting to this with equal parts of inefficiency and panic. U.S. authorities permitted the export of a large computer for a West German research center only under the condition that the computer not be used for certain calculations. European producers of satellites were unable to obtain American components because they planned to supply them to China and Indonesia. The COCOM refused to allow the Pegard machine factory in Belgium to sell a milling machine to the Soviets because, it was claimed, the machine can be used for military purposes.

Now the Pentagon wishes to deal even more strictly. This fall a law goes into effect in the United States that will make not only American technology less accessible to the rest of the world but also American knowledge in the form of data and publications. The dissemination of any sensitive information will then be subject to approval. Even now, states the FRANKFURTER ALLGEMEINE, "it can be seen that American scientists are not as willing as formerly to cooperate as consultants at technical conferences." It is U.S. industry that is profiting from this.

The situation could grow even worse for the non-COCOM countries Switzerland, Sweden and Austria. For the United States, the NEUE ZUERCHER ZEITUNG warns, is planning to exercise special restraint from now on in pampering these countries with its technological gifts.

Austria must thus show itself ready to cooperate. One measure now under dutiful consideration is Austrian legal sanction against undesirable export to the East. Until now, the refusal of the Trade Ministry to grant the

clearance declaration has been the sole deterrence. According to negotiator Lacina, the talks "are being held regularly," but what will actually result from them is still unclear. Says Lacina: "First we have to know what specifically the Americans actually want from us." "And," he added, "they don't yet know exactly themselves."

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## TECHNOLOGY TRANSFER

### COCOM DIPLOMATS FEEL POLITICAL ASPECTS OF JULY TALKS

Rotterdam NRC HANDELSBLAD in Dutch 24 Aug 84 p 9

[Article by editor Ben Van Der Velden: "Discussions in COCOM  
[Coordinating Committee for East-West Trade Policy] Acquire  
Political Undertones"]

[Text] Paris, 24 Aug--Everything is secret at COCOM, the organization of 14 NATO countries and Japan for the control of the export of strategic goods to the Warsaw Pact countries and China. Even the Japanese protest to the United States about making COCOM information public is secret. Diplomats involved in the secrecy connected with COCOM relate such things consequently only in confidential meetings, when it is clear that their name will never be known.

Moreover the United States answered Japan that confidentiality about all that is discussed in COCOM does not apply, when legal regulations in a country require reporting before parliament. It is still not known whether Japan agrees with that.

West European diplomats say that they will not break the secrecy officially, because they do not want to be accused by the United States of frustrating negotiations at COCOM with a publicity campaign. Just like Japan, they think it is difficult to accept that the United States in its efforts in recent years to make COCOM more important in combating the export of critical technology to Eastern Europe, is going to be less particular about confidentiality.

An agreement was reached in COCOM last month about a list of industrial goods which may not be exported to Eastern Europe any more, because the Soviet Union could use the technology for military purposes. However, it is said in COCOM circles that that agreement reached with the United States does not mean on the whole that Western Europe and Japan really agree with the United

States. It is considered that differences of opinion will be a factor this fall if last month's agreement must be developed into a detailed technical list.

#### Discussion

A diplomat says that in such a technical classification of a COCOM agreement in the past, there never have been political difficulties. But in view of the fact that there now has been discussion in the countries belonging to COCOM about how the agreement must be interpreted, he considers that the technical discussions will have "political undertones" on this occasion for the first time.

In the COCOM discussions, the United States has tried to get an export ban accepted for many more industrial products than other countries involved thought necessary. It was reported in French diplomatic circles, that finally thanks to France, a compromise was found. However, it was added that the fact that the American government does not want any conflict with Europe during the campaign for the presidential elections, played an important role.

A COCOM diplomat declares that meanwhile it was understood that an agreement had to be reached last month about the technology which is included in the agreement. Two weeks before the final date, the representatives of the 15 countries which met secretly, still did not agree with each other. Then, after the personal intervention of President Reagan, the Americans reportedly lessened their demands. The diplomat says, "no agreement would have been a failure. The Americans wanted to prevent a failure by all means."

#### Expanded

That does not mean that no results were achieved in the conversations. The list of industrial products which may not be exported to Eastern Europe and China was considerably expanded and moreover, according to the American plan, more spirit was infused into COCOM as an organization. Diplomats stationed in Paris, who secretly represent their countries with COCOM, under another official position, must allow more time for the latter assignment than was the case several years ago.

Under American pressure there was talk of applying a permanent COCOM embargo list to the latest technological developments. Until now that adjustment takes place every 2 to 4 years. That means that for the newest technological discoveries, national exports are certainly banned, but the COCOM countries only adopt a joint policy much later.



French diplomats have the impression that the United States wants to interpret the agreement reached last month more by the spirit than by the letter and consequently more flexibly than they. The FRG Minister of Economic Affairs Bangemann warned recently that his country will not accept more United States efforts to limit the export of technology to Eastern Europe.

It is expected that the discussion about how the COCOM agreement must be interpreted will concentrate in the future on the question of the delivery of electronic telephone exchanges to Eastern Europe. Last month the COCOM countries agreed on a temporary embargo for such exchanges until 1988.

#### Result

France thinks that the COCOM agreement will not be violated if the French nationalized enterprise, Alcatel-Thomson, now makes a bid for the delivery of such an exchange to Bulgaria after the expiration of the embargo in 1988. On the part of the Americans, this French attitude reportedly was described as looking for loopholes in the export ban agreed upon. But a diplomat of another western European country, which is one of the main participants in COCOM, says that France can count on support, because the French interpretation of the agreement would be precisely according to the letter.

According to expectation, it will come up for discussion during the technical development of the last months agreement, in which COCOM countries must reach an agreement, according to rules dating from 1949. The question is also important because acceptance of the French position in COCOM means automatically that the American multinational ITT can accept a Hungarian order for electronic switching systems for telephone exchanges. Hungary has placed the order with SEL /Standard Electric Lorenz/, a FRG branch of ITT, which even hopes by way of exception, to be allowed to begin export of the equipment in 1987, a year before the expiration of the COCOM embargo.

Moreover, during the recent conversations, the hope existed on the part of the western Europeans that a COCOM agreement would result in the American efforts to get more control over the export of technology to the Soviet Union through the administration of the Export Administration Law, being temporarily abandoned. Western European countries have repeatedly protested against the fact that Washington wants authority over branches of American businesses established abroad and also against plans to exclude European businesses which ignore American export restrictions from the American market. The extent to which the United States made

concessions at the COCOM discussions to Western Europe, makes observers fear that this subject will come up for discussion again after the American presidential elections under pressure from the Pentagon.

No country connected with COCOM wants to question even for a moment the principle of banning the export of advanced technology to Eastern Europe. However, the differences of opinion are no less because of that unanimity.

So there is the question of the illegal export of technology to Eastern Europe. A diplomat says that the United States has put pressure on western European countries not only to combat smuggling through inspection of the export of goods, but also through inspection of transit. He relates that the western European countries reacted with the statement that this cannot be done and that smuggling must be discovered on export--for example, from the United States--and not with the transshipment of a container in a European port.

#### Difficult Case

Another difficult case is China. According to the rules, the United States cannot export any equipment to that country which falls under the COCOM embargo, if the other COCOM countries do not agree to it. However, a COCOM diplomat says: "That is the theory, but the practice is that the United States requests more exceptions for export to China than for the Soviet Union. I wonder if we cannot speak of a China policy at COCOM. China certainly is not viewed more severely than the Soviet Union."

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## TECHNOLOGY TRANSFER

### NETHERLANDS OFFICIALS NOT IN AGREEMENT ON HIGH-TECH EXPORT

Rotterdam NRC HANDELSBLAD in Dutch 30 Aug 84 pp 1, 11

[Article by Ben van der Velden: "Bolkestein Disagrees With Ministry of Foreign Affairs: Dutch Protest Against Obstruction of Technology Exports"]

[Text] The Hague, 30 August--State Secretary Bolkestein (foreign trade) will at the end of September be making known to the American Government objections to a possible strengthening of the export administration law. His colleague from foreign affairs Van Eekelen said only recently that the government does not wish to upset relations with the United States with discussions about export restrictions.

Bolkestein says that he "will again hit the nail on the head" when he is in Washington next month. According to him, continual pressure is being exerted on the American Government at all levels not to restrict the export of technology according to a bill that has been tabled for some time.

Van Eekelen has said that at this point there is absolutely no need for a quarrel with the United States in the area of trade. According to him, relations with Washington are too delicate for that. But Bolkestein feels that he is pursuing normal Dutch policy in expressing objections to the American Government. He protested in Washington just last year.

He says that it is "silly" or "not juridical" to, as the United States wishes, accompany goods abroad with legislation from the country of origin. Washington wants to sharpen surveillance of American firms and of goods of American origin abroad by means of a renewed export administration law in order to combat the export of high-grade technology to Eastern Europe, among other places.

According to Bolkestein, nothing of the kind has ever been seen before. He accuses the United States of betting on two horses with regard to the export of technology. On the one hand, arguments are made for free trade, while on the other hand trade restrictions are proposed. "The Americans cannot hedge their bets by pursuing a separate national policy alongside international agreements on the export of technology," he said.

He also thinks that Japan "may very well be right" in its protest of the disclosure by the United States of data from COCOM, the organization of 14 NATO countries and Japan for control of the export of strategic goods to the countries of the WARSAW Pact and China. Last month an accord was reached by COCOM concerning high-grade technology—primarily computer and communications equipment—which cannot be exported because the Soviet Union could use this for military purposes.

According to Bolkestein, there is no reason to accuse France of not keeping the accord because the French firm Alcatel-Thomson has offered to provide Bulgaria in 1988 with a telephone exchange for which an embargo is now in effect. The COCOM agreement stipulates that embargo until 1988, and Bolkestein does not feel that France is looking for "loopholes" by making a solid offer to Bulgaria now.

"The French are in keeping with the letter of the agreement, that is good enough," he says. He feels that only the list of goods for which an embargo is in effect, as agreed to by COCOM, should be enforced. Nothing more than the COCOM agreement need be demanded. But according to him the COCOM list must also fully apply to China, the country for which the United States often requests from COCOM an exemption from an export ban.

Bolkestein takes into account that political difficulties could arise in the technical elaboration of the latest COCOM accord this fall, because different countries are interpreting the agreement in different ways.

The Dutch Government is moreover often lacking in the technical knowledge necessary to judge what the embargos proposed by COCOM mean exactly for the export of technology. For this reason, Dutch industries are being asked for advice; as far as computers and telephone exchanges are concerned, Philips is playing a leading role in this.

"We are certainly not pushing for a strengthening of the export stipulations," says Director G. Zweers of the Eastern European regional bureau of Philips. Thus far he has experienced no difficulties in the strengthening of rules for the export of technology to the Warsaw Pact countries.

According to Zweers, Philips, which exports among other things medical equipment to Eastern Europe, never gambles with obtaining an exemption in connection with a COCOM embargo when making its offers. "We avoid embargos in advance and orient ourselves to sectors that can do no harm," he says.

One important reason for this is that Philips does not want any difficulties whatsoever with the United States. A total of 28 percent of the company's sales takes place in the United States and Canada, where Philips, with its subsidiary Signetics, is involved in the production of chips which can also be used for military purposes. Philips does not give any figures on sales in Eastern Europe.

## TECHNOLOGY TRANSFER

### BRIEFS

WEST EUROPE-CZECHOSLOVAKIAN AGREEMENTS--Prague--The CTK agency announced that on 1 August, the West European companies Voest Alpine (Austria), Lummus (FRG), and Snamprogetti (Italy), signed contracts in Prague, to provide technical documentation to the Czechoslovakian chemical industry. These are documents for the construction of hydrocracking units at the petrochemical installations of Litvinov (North Bohemia) and at Bratislava's (West Slovakia) Slovnaft. Czechoslovakia will build the equipment itself, and plans to put it in operation toward 1988. The contracts were signed with the Czechoslovakian foreign trade enterprise Technoexport, and represent a revenue of the order of 140 million korunas (about 109.5 million francs). [Text] [Paris AFP SCIENES in French 2 Aug 84 p 8] 11,023

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